

# Identification and protection of genetic features of traditional settlement landscape: A case study of Daxu Ancient Town in Guilin

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**Abstract:** Guided by the theory of landscape genes, this paper selected Daxu ancient town in Guilin as the research object, combined with field research, historical literature reference and other research methods, and based on the actual situation of the ancient town and the principle of gene division, constructed the landscape gene index system of Daxu ancient town based on environment, layout, architecture and cultural characteristics genes. The problems of landscape gene protection in Daxu Ancient Town were found. The gene system of street texture was not perfect and the landscape nodes were scattered. Cultural characteristic genes are disappearing, and historical and cultural resources are not deeply excavated and exploited. The protection of ethnic architectural genetic elements lags behind, and a large number of old houses are damaged. The paper puts forward that the traditional ancient towns in scenic spots should be protected and developed from the aspects of integrity, characteristics, authenticity and effective management mechanism.

**Keywords:** landscape architecture, urban square, micro-climate, thermal perception, space form

Landscape gene theory is a research method of landscape characteristics proposed by Chinese scholars referring to biological gene theory. "Landscape genes" refer to cultural factors that have a decisive influence on the landscape characteristics of traditional settlements and are passed down from generation to generation [1]. Liu Peilin, a Chinese scholar, was the first to discuss the concept and theory of "landscape gene", believing that settlement landscape gene is the basic unit of traditional settlement "inheritance" and plays a decisive role in the formation of a certain settlement landscape [2]. In recent years, the influencing factors of foreign rural settlements have involved many aspects, such as tourism and rural settlements [3], government planning and settlement evolution [4], settlement landscape types and land use [5].

Traditional settlements refer to ancient towns and villages with relatively complete historical features that are formed in the historical period and retained with obvious historical and cultural characteristics and ethnic minority villages [6]. Their formation and development are mainly influenced by geographical environmental factors and local cultural factors [7]. Traditional settlements are one of the most direct and eye-catching characteristic landscapes on the surface, with distinctive settlement characteristics and regional cultural characteristics, and tourism is gradually replacing agriculture as the main industry in many traditional settlement areas [8-9].

At present, researches on traditional settlements from the perspective of landscape genes have involved many aspects, such as the characteristics and protection of landscape genes of traditional settlements [10-11], the identification and extraction of cultural landscape genes [12], and the study of landscape gene atlas [13]. It is reported that in 2005, The Ministry of Housing and Urban-Rural Development and the Bureau of Cultural Heritage included Daxu Ancient Town in the second batch of Chinese historical and cultural towns. However, the landscape features rich in mountains and rivers and ethnic minorities are impacted by modern commercial culture. Therefore, the research on the landscape genetic characteristics of Daxu ancient Town is strengthened. It is of great significance and realistic urgency to promote the protection and inheritance of national culture in Daxu Ancient Town as well as the sustainable development of economy and society.

## 1. Research Overview

### 1.1 Overview of the study area

Guilin belongs to the subtropical monsoon climate, mild climate, abundant rain, very conducive to the development of smallholder economy and residents' life. Daxu Ancient Town is located in the southeast of Guilin City, east of Guiliu Highway and upstream of Lijiang River Scenic Spot. Its geographical location is 110°24'30" --110°25'30" east longitude and 25°10'50" --25°11'05" north latitude. The administrative division covers an area of 193.78 square kilometers with a total population of 51.6 million. The town has a permanent population of 15,000, with a cultivated land of 35.2 hectares and 161 natural villages under its jurisdiction. Daxu ancient town is not only the land and water dock in north Guangxi, but also the distribution center of agricultural and sideline products and imported products in the eastern suburbs of Guilin. The town is low in the south and high in the north. It is a hilly area surrounded by mountains and an important waterway transportation hub on the Lijiang River.

### 1.2 Research methods

This study combined with field investigation, history, literature research methods, such as, taking the research on ancient town landscape building, analysis its evolution mechanism, explore its inheritance content and describe the landscape characteristics, expand the application field of the theory of landscape genes and enrich its content system, for a big fair as traditional settlement landscape gene identification and inheritance to provide the reference.

## 2. Genetic identification of cultural landscape in Daxu Ancient Town

### 2.1 Construction of index system

The most effective method to study the landscape characteristics of traditional settlements is to construct a landscape gene recognition index system. According to the research results of previous

scholars, the recognition of landscape genes in traditional ethnic settlements can be roughly carried out from five levels of residential buildings, totem marks, subjective public buildings, environmental factors and layout forms, while the inherent cultural characteristics of traditional settlements should be taken into comprehensive consideration [14]. According to the actual situation of Daxu ancient Town and the above principles, it is divided into environment, layout, architecture and cultural characteristic genes. Combined with various gene features mentioned in the image map, the landscape gene identification index system of Daxu ancient Town is constructed (Figure 1).

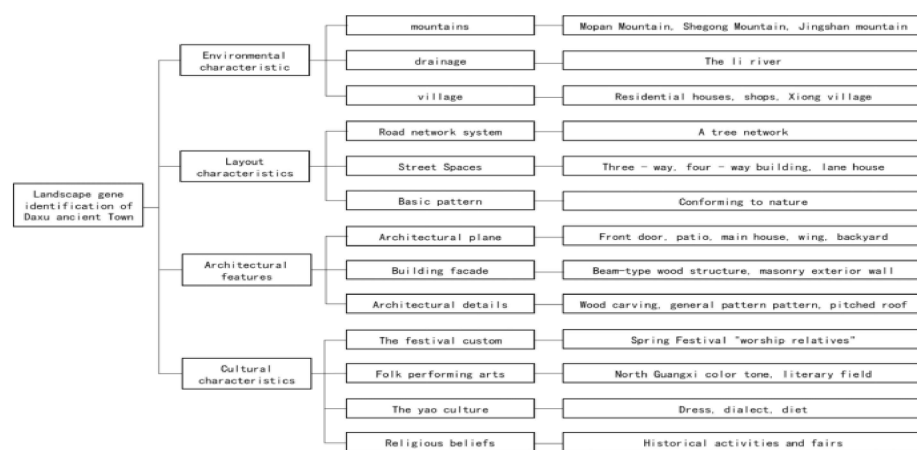


Figure 1 Index system of landscape gene identification in Daxu Ancient Town

## 2.2 Recognition results of landscape gene features in Daxu Ancient Town

### 2.2.1 Environmental characteristic gene -- rural settlement pattern of "landscape outside, tradition inside"

Notes on Water Classics wrote: "Li Shui also comes from Yanghai Mountain, Xiang Li has the same origin, divided into two parts, south li Shui, north Xiang Chuan". The time-honored Water resources of Lijiang River nurtures many villages and towns, and many famous trees and ancient trees and tourist attractions are preserved on the tributaries of Lijiang River. Maozhou Island, Gudong Waterfall, Shili Gallery and other things confirm the rich ecological resources of Lijiang River wetland. Influenced by the traditional ancient Chinese philosophy of "unity of man and nature" and feng shui pattern, Daxu ancient Town has a linear structure. The dwellings are built along the water and the streets are crisscrossing. The overall layout is fully integrated with the surrounding environment. Daxu Ancient Town is a typical landscape rural traditional town, surrounded by Shigong Mountain, Jingshan Mountain, Mopan Mountain, and Maozhou mountain in the west of the town. The land is fertile and the water is abundant. The town is surrounded by green mountains and clear water, and most of the houses in the town are brick and wood structures, which meet the ancient residents' yearning for landscape rural life. Its karst landform features are significant, with a large area of ecological farmland and forest, high vegetation coverage.

### 2.2.2 Characteristic genes of layout -- the spatial pattern of cities based on streets and water and the traditional residential settlements with shops as the core

Daxu Ancient Town is supported by Lijiang River, with the old street as the skeleton. The streets and wharves are connected by various laneways that intersect the old street vertically, forming a comb structure. The spatial pattern of the town is formed by streets and rivers, and the traditional residential settlements with shops as the core are the outstanding features of the town. Up to now, there are still a large number of well-preserved characteristic dwellings, commercial shops, Bridges, temples, guild halls, old streets, square gates, ancient pagodas and so on. In terms of the layout of the town, the overall road planning is distributed in two axes, with important landscape nodes distributed along the vertical axis, and the "one-character" ancient commercial street stretching up to 2 kilometers in length parallel to the Lijiang River along the horizontal axis. In the western part of the town, there are a large number of residential houses and old shop sites, which belong to the quiet area. In the eastern part, there are a large number of modern shops and open scenic spots, which belong to the downtown area. All landscape nodes are evenly distributed on the two axes of the ancient town (see Figure 2). The ancient street of the ancient town is 2.5 kilometers long and 2 meters wide. It is paved with 15,000 blue stone slabs. The "eight main Streets" and "thirteen docks" are still preserved. The most common intersection of traditional streets and lanes in Daxu Ancient Town is the three-branch road shaped like "DING". Small open space enriches the opening and rhythm of streets and lanes, providing a good space for interaction and communication for residents of the ancient town.

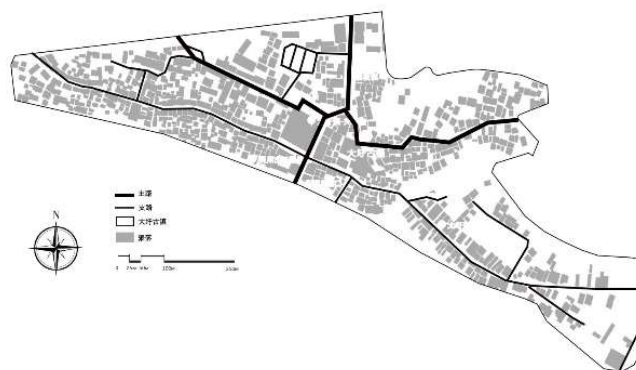


Figure 2. Overall layout of Daxu Ancient Town

### 2.2.3 Architectural characteristic gene -- ancient blue brick house with three cubicles and two rows or three rows

The ancient building area is more than 8,000 square meters, of which about two thirds are for the Ming and Qing dynasties. There are hundreds of ancient buildings from the Ming dynasty to the Qing Dynasty on both sides of the street, among which there are many blue-brick ancient houses with three rooms and two rows or three rows deep. In recent years, Daxu Town has followed the principle of "restoring the old as the old", carried out protective development of the ancient street, restored Jiangxi Guild Hall, restored qingstone Street and Wanshou Bridge, cleaned up the inner river, and gradually

restored the old charm of the ancient town dwellings along the street. The traditional houses, halls and pavilions of the ancient town are mostly built in the Ming, Qing and early Republic of China, accounting for more than 65% of the existing buildings. They are built along the slope of the river and are mostly two-story buildings. Because of the narrow streets, shops are not large, to the depth of development, often three to four deep, before the shop after the house, in order to expand the space, before the eaves out, some also build pick gallery - arcade. The whole dwellings are simple and elegant with strong practicality. The walls are plain white, and occasionally there are relief patterns that are concise and lively. Rich households are built to stack type fire gable, in case of fire isolation, not disaster and neighbors. The storefront houses of the ancient town are built along the slope, and the whole is light and transparent. The doors and Windows are not isolated from the wind. Laminated beam type wood structure, sloping top green tiles, larger eaves; Timber lintel, latticed fans, mullioned Windows and masonry facades; The house is more along the base of the fine chisel strip stone, next to the stone pier. The rich households in the ancient town have stacked and fallen type fireproof gable, which is higher than the roof and stacked in ladder form with the slope of the roof. Verandah Windows and doors are decorated with carvings, such as Hunan guild hall, High ancestral temple, mosque, Liao zhai, Huang Zhai, Li Zhai and so on. Along the street, there are more wood-wall shops, hanging arcade buildings, green tile roofs and fire walls. Generally, they are front shops and back storehouses or front shops and back houses. There are many traditional Chinese medicine shops, gold and silver jewelry shops, antique shops, grocery stores, snack shops and so on.

#### 2.2.4 Cultural characteristic gene -- Multi-cultural convergence, unique folk characteristics

Daxu Ancient Town in Guilin was founded in the early Northern Song Dynasty, revived in the Ming and Qing Dynasties, and reached its peak in the Republic of China. It has a history of one thousand years. As far as 600 years ago, Daxu became the largest of the four big country fair towns in Guangxi. Daxu ancient town has been an important trade town and life town since ancient times. "The Lustian Temple is on the Daxu River. After the morning and evening of liudian, the zhuang people returned to the lotus leaves covered with salt "and" the settlement was so abundant that it could only be seen in the village "are the poems describing and praising the grand situation of Daxu Ancient Town respectively by Xie Jin, a grand scholar of the Ming Dynasty, and Xu Xiake, a great traveler. During the Northern Expedition, Sun Yat-sen made a speech at tangfang Wharf in Daxu (1921) to promote the northern expedition. During the War of Resistance against Japanese Aggression, Daxu ancient town, known as "little Guilin", often attracted tens of thousands of people to rush at Daxu ancient town, and more than 200 ships were docked at the wharf. It was a veritable major trade town that could maintain such a flourishing trade scene in turbulent times. In 2005, the Ministry of Housing and Urban-Rural Development and the State Administration of Cultural Heritage included Daxu Ancient Town in the second batch of Famous Chinese historical and cultural towns. The ancient town still has many bamboo weaving workshops, straw sandals workshops, traditional funeral stores, grass medicine clinic, old barber shops and other ancient handicraft workshops. The convenient water transportation of Lijiang River and several docks in Daxu ancient Town bring about the prosperous economy and trade. Diversified cultures meet and deposit here, but Daxu still retains and inherits its original folk customs.

### **3 Problems encountered in landscape gene protection of Daxu Ancient Town**

#### **3.1 The genetic system of street texture is not perfect, and the landscape nodes are scattered**

According to the results of random inquiry and field investigation of tourists, the villages and scenic spots in the western part of the ancient town are less than those in the eastern part of the town during holidays. The scenic spots in the western part of the ancient town are mostly closed and full of villages. Along the streets, you can see many aborigines chatting, basking in the sun and making rice noodles, which forms a sharp contrast with the prosperous trading market in the eastern part of the ancient town. Quiet zone is advantageous to the villagers, is disturbed by too many tourists visit and keep illicit close space, but the problem is the ancient town tourists distribution imbalance, the holidays of ancient town in eastern and western landscape nodes were snubbed, ignored, and small retail stores in the west of the income and the eastern contrast is relatively small, is not conducive to the overall development of the ancient town. Analyses the reason of less ancient western visitors, it is because of the ancient town planning, tourists from after the entry into, not too cold and cheerless and view on the left side of the landscape node, did not pay attention to keep building on protection and development of "true", also does not have fully developed condensation in the culture behind the building, the second is in the west of the landscape node is too scattered, For example, "Rain Pavilion" and "Sun Yat-sen Memorial Hall at Daxu" are located in the latter part of the western axis. As the landscape nodes in front are not too attractive, tourists are reluctant to go back and choose to go east instead of sticking to the most western part. Compared with the eastern part of the ancient town, there is a rupture between the two: the eastern part has a waterfront and well-preserved ancient architecture, which is easier to attract the attention of tourists. Therefore, on the whole, the ancient town's landscape nodes are scattered, and there is no reasonable tourism ring route, nor is there a single landscape route developed to attract tourists. It can be said that the ancient town has not determined a clear tour project and tour route, tourism reception facilities are not complete, tourism service level is low, resulting in the tourist resources of the ancient town tilt and waste of funds for protection and development.

#### **3.2 Cultural characteristic genes are disappearing, and historical and cultural resources are not deeply excavated and exploited**

Daxu ancient Town has rich historical and cultural resources, but the combination of rich historical and cultural resources and solid buildings is not close enough. Daxu Museum does not reflect the overall style and historical changes of Daxu. Only the first floor is open to the public. Visitors are not allowed to see the floors above the first floor. In the exhibition hall on the first floor, many old plaques show the traces of time under the light and shadow, and some antique shops reproduce the grand occasions of the past. However, these single reconstruction and the stacking of a large number of plaques lack certain explanation and guidance, which does not make the visitors resonate with

these cultural relics. In the depth of Daxu Museum, there is a stage at the back of the building, but due to the complicated journey and no introduction of scenic spots, there is no way to find out the past life of the stage. In terms of combining history and culture, it is a kind of deficiency of Daxu Museum. As a place for collecting, storing, displaying and researching objects representing natural and human cultural heritages, the museum obviously lacks certain management and development in Daxu, and does not fully integrate with the historical and cultural background of Daxu, nor does it provide too much value of cultural and educational communication to the public. At the same time, in the streets and lanes of Daxu, relics and sketches that can reflect the history and culture are scattered in every corner of the ancient town, and the historical and cultural resources are not deeply explored and exploited, and the popularization of science and technology to the public is not strong enough, so the residents themselves lack a sense of identity and belonging to the history and culture of Daxu. We only pay attention to the development of Daxu forms, but ignore the historical and cultural background of Daxu, do not pay attention to carry out a variety of activities and cultural propaganda, culture can not be inherited, lost the uniqueness.

The tourist goods in the town are of inferior grade, and there are almost no commercial activities that reflect the local characteristics, and the commercial folk culture of ancient country with thousands of years is not reflected. The food culture of Daxu town relies on Lingchuan cuisine and is mainly based on authentic dog meat series and Daxu Lijiang River fish. Wine-making has been famous since the Ming Dynasty. Up to now, many Guilin residents still speak highly of the local rice wine. However, the characteristics of Daxu's food culture are not fully reflected, and the food is mainly street snacks and pickles, lacking certain representativeness. In terms of accommodation, the ancient town lacks a certain number of homestays and hotels, which can not meet the needs of tourists to stay in Daxu, enjoy the scenery and experience the rural life back to nature. Daxu at night lacks the development of light, which can not attract too many tourists to stay here overnight and return. In terms of tourism facilities and travel, the overall width of streets and lanes in the ancient town is relatively narrow, and there are a large number of tourists during holidays, which is not conducive to the evacuation and concentration of tourists. The town has few public facilities, the number of garbage cans and toilets is far from enough, and businesses and shops do not have large capacity to carry too many tourists. The town has too few recreational facilities and lacks large-scale activities and small-scale handicraft interactive experience under a certain cultural background, which makes the town less attractive.

### **3.3 The protection of ethnic architectural genetic elements lags behind, and a large number of old houses are damaged**

Many sites of the ancient town suffered massive damage due to natural and some man-made reasons, and were preserved through some restoration from qing Dynasty to modern times. However, some ancient buildings have been demolished, leaving only some shops after reconstruction and restoration (see Table 1). The ancient town is mainly built with wooden structure, and the streets and lanes are not wide. The lack of fire boxes in the town makes the town generally have certain fire hazards. The protection of some ancient buildings became a mere formality without better use, and the Rain Pavilion became an activity center for the elderly, which made tourists stop at the gate of the rain

Pavilion and lost its attraction to tourists. With the improvement of modern living conditions, most of the aborigines in Laojie town go out to work or choose to live in new areas with better conditions. The villages are gradually hollowing out, and there are many dilapidated buildings and abandoned old houses. The maintenance and development of these dilapidated houses affect the beauty of the town, and also pose security risks. In order to pursue modernization, residents demolished a large number of folk houses and rebuilt modern residential buildings. Ancient buildings and modern buildings were mixed together, and a large number of foreign architectural cultures were randomly added, which made the ancient town lose its traditional style and aesthetics and integrity.

*Table 1 Protection statistics of some ancient buildings and sites in Daxu Ancient Town*

Name	Architectural age	current situation
Wan Shou bridge	It was built in the Ming Dynasty and restored in the early Qing Dynasty	Well preserved as a whole
mosque	It was built in the Ming Dynasty and rebuilt during the Guangxu years of the Qing Dynasty	Well preserved as a whole
Guangchang cloth shop	Architectural appearance in early Republic of China	Well preserved and dilapidated inside
Daxu wharf		Well preserved as a whole
Yu Ting	Eight years of the republic of China	Well preserved and become a cultural center for the elderly
Yang Jingling old house	The architectural appearance of the late Qing Dynasty	Well preserved and dilapidated inside
Guangxi Guangdong Water transportation and Biaoyuan bureau		Well preserved as a whole
Wan Shou palace	Built in the Qing Dynasty jiaqing years, restored in 2002	Well preserved as a whole

## **4 Protection and development strategy of Daxu Ancient Town from the perspective of landscape genes**

### **4.1 Scientific planning, adjust the overall structural layout of the town**

The overall layout of Daxu ancient town should be connected with landscape nodes to improve the overall quality and form a scale effect so that tourists can have a complete understanding of Daxu. Under the condition of maintaining the original landscape spatial pattern, Daxu should clearly define tourist items and routes, launch high-quality tourist routes and scan the scenic spot map online to obtain tourism explanations, and build a new Daxu ancient town through digital technology to meet the needs of tourists and extend the vitality of the ancient town. Under the condition of retaining the "authenticity" of the building, in the west, more scenic spots will be opened and restored to attract the attention of tourists. Fully respect the historical appearance of the ancient town, and repair the damaged facade space form in the ancient town. Construction of leisure space nodes, appropriate increase of street green space and gathering square, so that people have places to gather and disperse, appropriate addition of some garden sketches and greening nodes, while maintaining the original style of the town, to meet the leisure needs of tourists. The tangled wires above some old buildings in the town damaged the beauty of the skyline and were not conducive to the overall planning and management of the scenic spot. It was necessary to optimize the skyline contour and remove some wires.

### **4.2 Excavate the cultural connotation and create the exclusive characteristics of Daxu**

The government can attract investors to protect and develop Daxu Ancient town by taking advantage of its rich history and culture and a large number of architectural sites, so as to form an integrated tourism experience town guided by the government, which not only fully continues Daxu's business style from ancient times to today, but also integrates modern life on this basis. Traditional cultural performances and sports activities performed by local residents will be carried out in combination with traditional festivals, so that tourists can participate in the festival and experience the unique folk culture of Daxu. The main characteristic of Daxu is its own prosperous commercial and trade characteristics, which excavates the local commercial culture and thus leads to new cultural industries. From the point of view of publicity, we should shoot more films and documentaries to vigorously explore the folk customs of the ancient town in the past, show some historical facts in the past, and promote the ancient town in these ways. From the perspective of tourism, the souvenirs of ancient towns are too simple and do not highlight their unique culture. Most of them are popular food, which cannot attract tourists to consume. It is necessary to create the cultural atmosphere of the ancient town from multiple angles, dig deep the clue of national culture, set up unique souvenirs and propaganda slogans of the ancient town, add clothing, stationery, postcards, commemorative stamps and other items, so as to let tourists understand the uniqueness of the ancient town.

### 4.3 Repair the ancient buildings and maintain the authenticity of the buildings

Architecture is a solidified culture. For ancient buildings and sites, we should maintain their "authenticity", restore them on the basis of protection, adhere to the principle of "protection first", and keep the bottom line of "protection before development, development subordinate to protection". In terms of restoration, the government-led operation mode with indigenous participation is implemented to improve residents' enthusiasm and cultural identity, guide residents to participate in the protection and restoration of ancient buildings, actively rescue endangered traditional buildings, and reinforce weak areas. By visiting elderly aborigines and looking up historical resources, we can restore the ancient buildings to the maximum extent possible to preserve their original features. Do a good job in the classification and management of the remaining ancient buildings. Make a list of the number and specific preservation of ancient buildings and regularly check and repair ancient buildings. Organize experts to conduct on-site investigation and repair in time for some ancient buildings with hidden security risks and extremely endangered. For the redevelopment and utilization of ancient buildings, some cultural activities, such as calligraphy art and knowledge competition, should be carried out centering on the historical deposits and development process of ancient buildings without destroying the ancient buildings.

### 4.4 Establish an effective management mechanism and improve tourism service facilities

Manage the shops in the ancient town and adjust the inferior tourism products to avoid a single tourism product. Draw lessons from the successful experience of other ancient towns, excavate Daxu's unique food culture and tourism specialties, and improve accommodation services. Establish an effective management mechanism, improve tourism service facilities, increase the number of trash cans, toilets, fire facilities and other public facilities in the town, and solve the hidden security risks and hidden needs of the town. On the road of sustainable development, we should hold more large-scale activities and small-scale handicraft interactive experiences that reflect folk customs, so that tourists can participate in the ancient town and remember the unique cultural atmosphere of Daxu during the experience. A greater degree of develop tourism potential, dock to dock can accept more tourists, rich variety of water activity and water, create the unique landscape, taking the night use of lighting effects to build the atmosphere of the ancient town, can let visitors in the night boat tour lijiang, top grade GuiJu jiang, hear the tour guide said to the introduction of big fair settlement. The national cultural characteristics are also integrated into the light show, so that the national characteristics are fully reflected. Strengthen management, improve the overall quality of the staff of the scenic spot, implement unified management of the scenic spot, and formulate certain standards to serve tourists.

## 5 Conclusion

Daxu ancient Town, as a famous historical and cultural town, has high historical and cultural protection value. We should think about the protection and development of ancient towns from multiple perspectives, and avoid the "same city". The most important thing is to adhere to the principle of prioritization of protection, maintain the "authenticity" of architecture, create special cultural activities based on local characteristics, and better reflect local culture in modern times combined with science and technology. From the perspective of sustainable development, the scenic spots should be connected, tourism service facilities should be improved, a more efficient management mechanism should be established, and the overall quality should be improved so that Daxu Ancient Town can be better protected and developed.

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